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UNITED STATES DEPARTMENT OF AGRICULTURE  
AGRICULTURAL RESEARCH SERVICE  
PLANT PEST CONTROL BRANCH

MANUAL OF APPROVED TREATMENT PROCEDURES  
TO BE USED UNDER THE KHAPRA BEETLE QUARANTINE

Prepared by the Stored-Product Insects Section,  
Agricultural Marketing Service, in cooperation  
with the Khapra Beetle Control Program  
(Revised September 1, 1956)

The khapra beetle Federal domestic quarantine which became effective February 21, 1955, provides in Sec. 301.76-5 that certificates may be issued for interstate movement of regulated articles designated in Sec. 301.76-3 when they have been treated under the supervision of an inspector and in accordance with methods selected by him from administratively authorized procedures known to be effective under the conditions in which applied.

For that purpose the attached procedures for the treatment of regulated articles enumerated in Sec. 301.76-3 of the quarantine are administratively authorized by the Chief of the Plant Pest Control Branch of the Agricultural Research Service.

The fumigants authorized for the treatment of regulated articles are lethal to man and certain precautions must be taken in handling them. The facts relative to them must be brought to the attention of some responsible person concerned with treatment at an infested establishment before the treatment is applied.

CAUTION--Methyl bromide is a gas at ordinary temperatures. It is colorless and practically odorless in concentrations used for fumigation of regulated articles. It is a poison and the operators are advised to use gas masks approved by the U. S. Bureau of Mines for use with methyl bromide, when exposed to the gas in concentrations used in fumigation. The masks should be equipped with canisters designed to protect against organic vapors, and should be replaced as needed. These canisters are usually black in color. Fumigation chambers should be freed of gas before entering them. The methods of applying methyl bromide provide for a closed system in which the operator is not exposed to a dangerous concentration of gas, provided there is no leakage in any exposed portion of the system. Extreme care should be exercised to keep all joints of such apparatus tight and to replace any defective parts to prevent accidents. Operators should avoid getting any liquid methyl bromide on their clothing or bodies at any time. Additional information as to precautions to be taken is available upon request.

HCN is a very dangerous fumigant. It has a characteristic odor but one short exposure to fumigation concentrations can be fatal. It should be handled only by experienced operators, and always by operators in pairs. A full face gas mask with appropriate canister should be ready for use any time HCN is used. Care must be used in properly aerating seeds following fumigation as the gas will persist in packaged or bulk seeds for several days. Litmus papers are available to test for low concentrations of HCN in air, and should be available at every fumigation site. Workmen should not be permitted to work in a room with fumigated seed until these test papers show it is safe.

Disclaimer--The following clause should be brought to the attention of owners of regulated products which are to be treated:

"In authorizing these treatments as a basis for certification of regulated articles, it is understood that no liability shall attach either to the U. S. Department of Agriculture or to any of its employees in the event of injury to the regulated products or to the operators."

All costs incident to the treatment of regulated products shall be at the expense of the owner of the regulated articles except that there will be no charge for the services of the Federal or State inspector observing the treatment.

This manual is arranged under the following main headings:

Treatment of sacked or packaged commodities with methyl bromide

Treatment of bulk commodities with methyl bromide

Treatment of used sacks and bagging with methyl bromide

Treatment of seeds with HCN

Heat treatment

Fumigation of structures with methyl bromide

Date September 19, 1956

  
E.D. Bangor  
Chief, Plant Pest Control Branch

TREATMENT OF SACKED OR PACKAGED COMMODITIES WITH METHYL BROMIDE

90-1416

1. Commodities

Materials regulated by the quarantine, packaged in sacks, multiwalled paper bags, shipping cartons, or other containers not containing a non-permeable layer such as polyethylene or cellophane film, wax paper, or tar.

2. Dosage schedules

All temperatures given are for the commodity, not the existing air temperature.

a. For sacked grain or seeds treated in approved chambers

Temperature of commodity	: Dosage in : lbs./1000 cu. ft.	: Exposure in hours
90° or above	2.5	12
80 - 89°	3.5	12
70 - 79°	4.5	12
60 - 69°	6	12
50 - 59° <u>1/</u>	10	12

1/ It is recommended that fumigation of commodities not be performed at commodity temperatures of less than 60° F. unless absolutely necessary. The inspector should ask for a ruling in any instance where grain temperatures touch this fringe area.

b. For sacked or packaged commodities treated under tarpaulins, in freight cars or van trucks, or enclosures other than approved chambers.

12-hour exposure period

Temperature of commodity	: Minimum rate of application : per 1000 cu.ft. 1/	: Minimum con- centration at : 2 to 4 hours 2/	: Minimum con- centration at : 12 hours 2/
90° F. or above	2.5 lbs.	20 ounces	15 ounces
80 - 89°	3.5 lbs.	30 ounces	20 ounces
70 - 79°	4.5 lbs.	40 ounces	25 ounces
60 - 69°	6 lbs.	50 ounces	30 ounces

1/The initial dosage shall not be less than that stipulated; however, if the enclosure is not tight, methyl bromide shall be added, either initially or during the treatment, to meet the concentration standards.

2/From the 4- to the 12-hour period the concentration shall be held at or above that indicated for the final reading.

24-hour exposure period 1/

Temperature of commodity	: Suggested rate of application : per 1000 cu.ft. 1/	: Minimum con- centration at : 4 to 8 hours 2/	: Minimum con- centration at : 24 hours 2/
90° F. or above	4 lbs.	10	10
80 - 89°	6 lbs.	15	15
70 - 79°	8 lbs.	20	20
60 - 69°	12 lbs.	25	25

1/It is assumed this schedule will be used for finely milled products such as cottonseed meal where it is difficult to get the concentrations stipulated in the 12-hour schedules.

Where the 12-hour schedule is used, the concentration shall be brought up to the desired level as rapidly as possible, and held there through the 4th hour. It shall not drop below the final permissible level between the 4th and 12th hour. If a concentration does not reach the desired level by the second hour, the exposure period shall be extended to compensate for the delay, i.e., it shall continue at least 10 hours after the time the concentration reaches the desired level. More methyl bromide can be added at any time to reach the desired levels.

Where the 24-hour schedule is used, the concentration shall be brought up to the desired level within the first 4 hours, and held at or above that level for the remainder of the exposure period. If the desired level is reached after the 4th hour, the exposure shall be extended by the amount of time in excess of 4 hours needed to reach the desired level of concentration. Experience has indicated that, if the concentration is on the upgrade when the 4-hour period is reached, it usually is not necessary to add methyl bromide to maintain the stipulated concentration level; but, if the concentration is high initially and is falling at the 4th hour, it is usually necessary to add methyl bromide to maintain the stipulated concentration level.

Each lot of the commodity fumigated shall have a minimum of 5 sampling tubes, two in the centers of center bags or packages, one in an outside bag, one on the floor and one in the headspace. Large lots should have additional sampling tubes in the proportion of 1 tube per 20 tons of commodity, mostly placed deep in the commodity.

Gas concentrations should be read frequently until the desired concentration level is reached at all sampling points and as often thereafter as experience shows necessary to keep the concentration above the final level. The final concentration reading shall be taken in each treatment.

### 3. Procedures

#### a. Approved chamber

An approved chamber shall be one lined with a gas-impervious material such as sheet metal, or concrete, masonite, or plywood painted with a rubber, vinyl plastic, or asphalt base paint. All openings shall have a double row of sponge rubber strip gaskets so that the doors can be fitted tightly against them. A blower of sufficient capacity shall be provided, and so located as to circulate the fumigant completely around the load, and to exhaust the fumes rapidly at the completion of the fumigation. The blower shall deliver enough air under operating conditions to equal at least one air change every 3 minutes in the chamber. Chambers of more than 100 cubic feet capacity should be equipped with a vent and duct to permit the gas to be evacuated to the outside of the building, for safety reasons.

The chamber shall also pass a pressure test before receiving approval, and shall be retested at any time the inspector so designates. The pressure test shall consist of preparing the chamber as for fumigation and by blowing air into it, produce an internal pressure of more than 50 mm. on a kerosene-filled, open-arm manometer. The air shall then be shut off, and the time elapse observed for the pressure to fall from 50 to 5 mm. If this period is 22 seconds or greater, the chamber shall be considered as suitable.

All chambers constructed after the date of this revision shall be equipped with an entrance port for gas sampling tubing. This may consist of a piece of 3/4-inch or larger conduit or iron pipe suitably sealed in the chamber wall at a convenient location, and threaded on the outer end so that it may be capped or suitably sealed when not in use. Other arrangements may be installed if they will permit the ready insertion of not less than 5 lines of 1/4-inch OD tubing.

The commodities to be fumigated shall be placed on the floor rack, or on pallets or on dollies, in the chamber to permit free movement of gas under the load. The time shall be measured from the moment all of the dosage has been introduced. The usage rate shall be regulated according to the lowest temperature of the commodity. The fumigant shall be released in the air blast of the blower. It shall be volatilized before it is introduced, or injected as a fine spray that will volatilize before coming in contact with the commodity under fumigation. The blower shall be operated for not less than 30 minutes at the start of the fumigation. At the end of the exposure period, the discharge vent shall be opened, the door loosened to permit some air flow inwards, and the load aerated not less than 15 minutes before removal to a ventilated storage area.

b. Tarpaulin

Plastic films, plastic- or rubber-coated tarpaulins shall be considered suitable for this purpose. The tarpaulins shall be in good condition and free of holes. In cases where more than one tarpaulin is used, the tarps shall be lapped at least twelve inches at the unions, the laps tightly rolled together and fastened, either with Hargrave, or equal, spring clamps, placed at intervals of not more than 12 inches along the entire length of the roll, or by placing wooden 2" laths along each side of the roll and clamping there together with C clamps placed at 12- to 14-inch intervals. The spring clamp, however, will be found preferable as it will provide more flexibility of the seams and better conformity to the shape of the loads. The cover shall be of sufficient size to provide for a floor lap of not less than 1 foot around the pile and shall be securely sealed

against the floor with sand, earth, or sand snakes. If sand snakes are used, they shall be not less than 2" in diameter and lapped at least 1 foot.

The commodity shall be stacked on pallets or dunnage to permit air passage along the bottom of the load. A single pile shall not exceed 10 feet in height, 25 feet in width, or 50 feet in length, and the stack shall be so arranged, with individual sacks or frames, that the covering is held approximately 2 $\frac{1}{4}$  inches above the top of the load and 12 inches from the center of each end of the load to permit free air circulation. Multiple stacks may be fumigated under a common cover provided the inspector is convinced that adequate circulation can be accomplished.

Where finely milled products, such as cottonseed, are involved, experience has shown that stacks should not be greater than 5 feet in cross or vertical dimensions, since penetration may be very slow.

Pallets 48 x 60" made of three (3) 2 x 4's, 5 feet long, set on edge and stripped with 1 x 4's on 12-inch centers, have been found to be satisfactory for fumigation work. For heavy loads, the stripping should be closer together, but cracks of at least 3 inches should be left between the strips. By stripping the pallets on both the top and bottom, they provide acceptable airways when stacking sacked material over 10 feet for fumigation. (See illustration )

A blower having a capacity per minute of 1/5 the cubic content of the area involved shall be placed so as to pick the air up from the floor and discharge it along the top of the stack. The fumigant shall be introduced as a volatilized gas into the discharge stream of the blower. The blower shall remain in operation during the period that the gas is being introduced and for at least 30 minutes thereafter.

At the end of the exposure period, the edges of the tarpaulins shall first be rolled up for a period of not less than 15 minutes, after which the tarpaulins can be removed. The area should have adequate ventilation to dispel the gas. A blower or pedestal fan should be used if in the opinion of the inspector such is needed.

c. Freight cars and van trucks

Only tight steel cars, reefer cars, or tight van trucks shall be approved. The floor of freight cars (and van trucks) shall be covered with sisalkraft paper, light weight roofing paper, or other gas-impervious materials unless designated otherwise by the inspector. The commodity shall be stacked on pallets or a floor

rack to permit circulation beneath the load. A blower shall be placed to discharge down the length of the car or the van truck and operated for not less than 30 minutes at the start of the fumigation.

Car doors and doors of van trucks shall be adequately sealed with masking tape and flour paste, or a putty made from ground asbestos and water, or laminated paper. The bunker drains in reefer cars should be sealed with water or wet paper. The car shall not be moved until the exposure period is completed.

TREATMENT OF BULK COMMODITIES WITH METHYL BROMIDE

1. Commodities

Wheat, barley, shelled corn, milo, mixed feeds, etc.

2. Dosage schedules for methyl bromide

Temperature of commodity	: Minimum rate of application per 1000 cu.ft. <u>1/</u>	: 12-hour exposure period Minimum con- centration at 2 to 4 hours	: Minimum con- centration at 12 hours <u>2/</u>
90° F. or above	2.5 lbs.	20 ounces	15 ounces
80 - 89°	3.5 lbs.	30 ounces	20 ounces
70 - 79°	4.5 lbs.	40 ounces	25 ounces
60 - 69°	6 lbs.	50 ounces	30 ounces

1/The initial dosage shall not be less than that stipulated; however, if the enclosure is not tight, methyl bromide shall be added, either initially or during the treatment, to meet the concentration standards.

2/From the 4- to the 12-hour period the concentration shall be held at or above that indicated for the final reading.

Each lot of the commodity fumigated shall have a minimum of 5 sampling tubes, one inserted in the headspace, and 4 in the bulk commodity - one near the bottom at the load center, one near the bottom halfway to the load edge, one at the load center midway between floor and top surface, and one within 18 inches of the top surface. In large lots, additional sampling tubes shall be used in the proportion of one set of three tubes placed near the top, center, and bottom, for each 10 tons of commodity.

Gas concentrations should be read frequently until the desired concentration level is reached at all sampling points, and as often thereafter as experience shows necessary to maintain the concentration. The final concentration reading shall be taken in each treatment.

### 3. Procedure

Fumigation may be conducted in all-metal freight cars, van trucks, tanks, or other containers approved for this purpose by the inspector. The basic principle is to set up a recirculation system by withdrawing air from the floor area and discharging it into the head space above the load. This may be done in several ways.

#### a. Probe duct systems

In this system probes with perforated tips are inserted from the top surface of the grain so that the tip reaches the floor area. In freight cars 10 probes are used, or for other containers one probe for every 40 square feet of surface. In no case should any point within the mass be further than 10 feet from a probe. The probes are connected to a manifold which in turn leads to a blower. In freight cars the blower may rest on the top of the load, in which case it cannot be removed until the end of the exposure period. Or it may be located outside of the car and connected to the probes and to the head space by flexible tubing leading through a paper grain door.

The paper grain door can be installed before loading, in which case it is stripped to the inner wall around the doorway. If installed in a loaded car, the grain door is inserted across the doorway above the grain level. The top wooden retainer is loosened so the paper grain door can be slipped behind it. Then the wooden retainers are sealed with sisalkraft paper which is also taped to the paper grain door. Metal collars are inserted in the paper grain door to which the flexible ducts are attached. The intake duct is attached to the manifold of the probe system. The discharge duct empties into the head space. The opposite door is sealed in the conventional manner.

The fumigant is introduced as a gas into the air stream in the discharge duct or in the overhead space, and the blower operated for not less than 10 minutes. If the blower is outside the car, it can be disconnected and used on other cars. The flexible tubes are removed, the openings immediately sealed with a piece of sisalkraft and masking tape, and the outer door closed. The car shall not be moved until the fumigation is completed. The blower shall deliver under operating conditions, a volume per minute equal to not less than 1/5 the capacity of the car.

The car can be aerated, or permitted to move without aeration. All fumigated cars should carry a warning notice on both doors.

b. Floor duct systems in freight cars and trucks

A floor duct can be used if circumstances permit its installation before the car or truck is loaded. The duct shall reach from end to end down the center of the floor and shall consist of 4-inch downspout duct well perforated with holes. On freight cars a tee at the center shall lead either to the grain surface for connection to a blower placed on the surface, or to a paper grain door in one doorway. Metal collars are sealed in the paper grain door as noted in the previous section, to permit connection of flexible ducts to the blower. The intake is connected to the floor duct, the exhaust to the head space. From this point on the procedure is the same as noted above.

c. Recirculation system in tanks or elevators

This system shall consist of an air pickup source in the bottom of an elevator or tank, a blower, and a gastight return duct. The air pickup source must draw from enough area or high static pressure will result. (For example a 10-inch pipe perforated with 1463 one-half inch holes and wrapped in 10-mesh screen, worked well in a 125-foot elevator filled with shelled corn. A 3-foot solid metal cone with considerable clearance at the edges has worked well in the hopper of a 7,000 bushel tank. The air pickup was made from beneath the cone.) The top of the tank or elevator shall be sealed and the return duct shall lead into the sealed head space. The blower under operating conditions shall deliver not less than .05 cfm per bushel.

The fumigant shall be introduced into the return duct. The blower shall be operated not less than 15 minutes after all of the fumigant has been applied. At the end of the exposure period, the fumigant can be withdrawn from the grain if desired by diverting the blower output to the outside and operating the blower for several hours.

TREATMENT OF USED SACKS AND BAGGING WITH METHYL BROMIDE

1. Commodities--used sacks

2. Dosage schedules for methyl bromide

a. Where T/C gas analyzer units are available, the fumigation shall be conducted on the basis of concentration levels as follows:

24-hour exposure period

Temperature : Suggested rate : Minimum con- : Minimum con-  
of : of application : centration at : centration at  
commodity : per 1000 cu.ft.: 4 to 8 hours : 24 hours

90° F. or above	4 lbs.	10	10
80 - 89°	6 lbs.	15	15
70 - 79°	8 lbs.	20	20
60 - 69°	12 lbs.	25	25

b. When T/C gas analyzer units are not available the following dosage rates shall be applied:

Type of enclosure	Average temperature of commodity	Dosage in lbs./1000 cu.ft.	Exposure in hours
Approved chamber	60° or above	7	24
	40 - 60°	10	24
Tarpaulins	60° or above	8	24
	40 - 60°	11	24
Vacuum chamber	60° or above	8	3
	40 - 60°	9	3

3. Procedure

In normal atmospheric pressure NAP fumigation, sacks whether loose or in bales shall be on pallets or a floor rack, and provision shall be made so that circulation can be attained completely around the load. Otherwise the provisions for the fumigation of sacked commodities shall apply.

In vacuum fumigation, the vacuum should be sustained at 25" or more for the entire period of the exposure.

TREATMENT OF SEEDS WITH HCN

1. Commodities

Any seeds regulated by the quarantine.

2. Dosage schedules

a. For sacked or packaged seeds treated in approved chambers.

Temperature of commodity	Dosage in lbs./1000 cu.ft.	Exposure in hours
50° or above	4 lbs.	4 hours

b. For bulk or sacked seeds treated under tarpaulins, in freight cars, in elevator tanks, or enclosures other than approved chambers.

Temperature of seeds	minimum rate : of application : per 1000 cu.ft.	Exposure period	: Minimum concentration at 2 hours
50° or above	4 lbs.	4 hours	4 ounces

The concentration shall be brought up to the desired level as soon as possible. If this is delayed, the exposure period should be extended so that there is at least 2 hours at the desired concentration.

Each lot of seeds treated shall have a minimum of 5 sampling tubes. With sacked seed there shall be two in the centers of center sacks, one in the center of an outer sack, one at the floor level and one in the head space. In bulk seed one shall be in the head space and the others in the seed mass at points assumed to present the most difficult penetration. In large lots additional tubes shall be used in the proportion of 1 to each 10 tons of seed.

Lots of seeds with excessive amounts of dirt or fine foreign matter should be cleaned before fumigation.

3. Procedures

a. Approved chamber.

The procedures are the same as for methyl bromide.

b. Other enclosures for sacked seeds.

As for methyl bromide.

c. Enclosures for bulk seed.

As for methyl bromide, using recirculation.

## HEAT TREATMENT

### 1. Commodities

Feeds and milled products heated as part of the processing procedure, or other commodities that can be subjected to heat.

### 2. Temperature and exposure

The commodity shall be considered free from live khapra beetles if it reaches 180° F. during any part of its processing, or if it is held at 150° F., or above, for a total of 7 minutes. The commodity must move through, or be turned in the heating chamber, or otherwise manipulated to insure that all parts of it reach the required temperature.

## FUMIGATION OF STRUCTURES WITH METHYL BROMIDE

### CATEGORIES OF TREATMENT

#### Category 1 (Complete Property Fumigation and Treatment)

To comply with this treatment, all structures of related usage on a single property within the immediate environs of an infestation shall be placed under gastight tarpaulins and fumigated with methyl bromide at the rate of five pounds per 1,000 cubic feet for a continuous period of 48 hours.

Sampling points shall be used in each structure under fumigation. In structures of 50,000 to 100,000 cubic feet not less than six sampling stations shall be used. In larger structures, additional sampling points will be used at critical locations. In structures containing bulk grain or sacked material, sampling points shall be placed near the top, center, and bottom of stacks or bins of each representative material, through the center of the mass.

Circulation systems, ducts, or probes will be used, as dictated by experience, to facilitate the distribution of methyl bromide throughout the building and in bulk and sacked materials. Additional gas may be added during the exposure period when necessary or needed to maintain the desired concentration.

Concentrations shall be read from all sampling points at least at the 2, 4, 6, 12, 18, 24, and 48-hour intervals after the gas is introduced, and the concentration curve at each sampling point, as determined by a thermal-conductivity gas analyzer or by chemical analysis, shall remain above 32 ounces per 1,000 cubic feet for not less than an aggregate of any 24 hours or 24 ounces for 36 hours out of a continuous 48-hour or longer period. After the required concentrations have been maintained, no further CH<sub>3</sub>Br need be added for the balance of the exposure period.

Should the property under treatment, or portions thereof, fail to meet the concentration pattern within the 48-hour period, and a reasonable probability exists that compliance can be made by extending the exposure period beyond the prescribed time, such is permissible. Concentration readings may then be limited to only those parts of the property failing to reach the required concentration in the allotted period. Reading should be made from then on at intervals not in excess of two hours.

The area surrounding the structure or structures within the confines of the property shall be sprayed at least three times at three to seven day intervals, with a spray consisting of five pounds of actual malathion to each 100 gallons of diesel or fuel oil, until thoroughly wet. On asphalt type pavement, or in extenuating circumstances, water and malathion may be used. A pressure of 50 to 200 pounds has been found satisfactory. The last application is to be made after the covering of the structure is complete. Surface area shall be freed of all general debris by raking toward the building and including under cover. Where feasible, the surface area should be harrowed or disced between the applications of spray.

In instances where empty dairy barns, chicken houses, or the like--where no stored commodities are involved--comprise a part of the infested premise and where it is highly impractical to hold such structures under 48-hour coverage, the State pest control official and program leader may authorize the fumigation of such structures for a shorter period of time, such as a concentration of 64 ounces of methyl bromide per thousand cubic feet for 12 hours without a pre-or-post fumigation period. This provision will in no way affect the fumigation of other structures on the premises or the supplementary sanitation and spray program required for all properties.

Depending upon local conditions and as determined by the State pest control official and program leader following such treatment, the property may or may not be held for a series of inspections, as outlined for properties treated in accordance with Categories 2 and 3.

#### Category 2 (Partial Property Fumigation and Treatment)

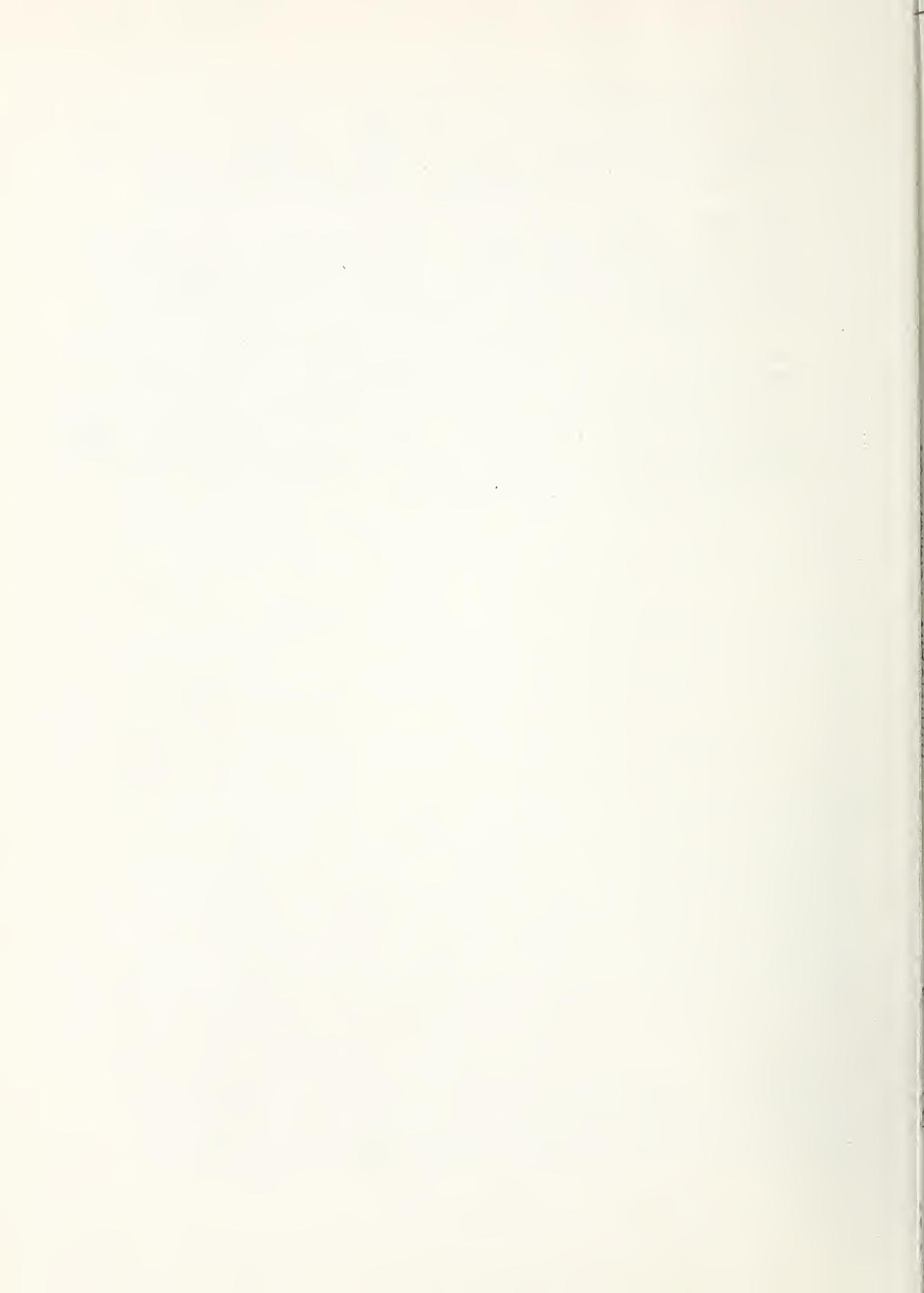
The treatment to be followed for properties in this category shall correspond to those outlined in Category 1, except that less than all the buildings of related usage that comprise the property may be fumigated when, in the judgment of the responsible State and Federal representatives, eradication may be accomplished by such a procedure. The success of this treatment shall be based upon not less than three inspections made of the entire property over a period of one year. At least 90 days shall elapse between each official inspection, and the last inspection shall be made during the month that release will be effected.

#### Category 3 (Interior Fumigation)

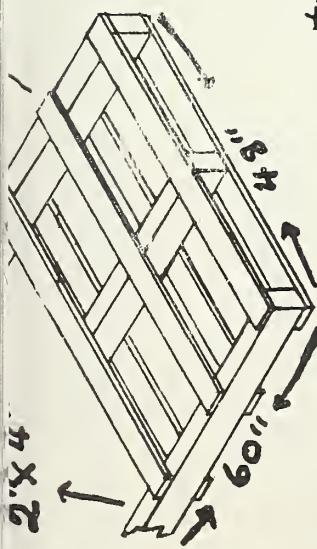
Interior fumigation may be defined as fumigation by sealing all openings in the structure with masking tape, putty, gastight paper, or other materials from outside of the buildings, and conducting the fumigation without benefit of tarpaulins or polyethylene sheeting.

This method of fumigation is less desired in treatments for khapra beetle because of the habit of the insect of crawling into cracks, crevices and other fissures or openings on both the interior and exterior of an infested structure. Only the Federal program leader and State pest control official may approve this treatment.

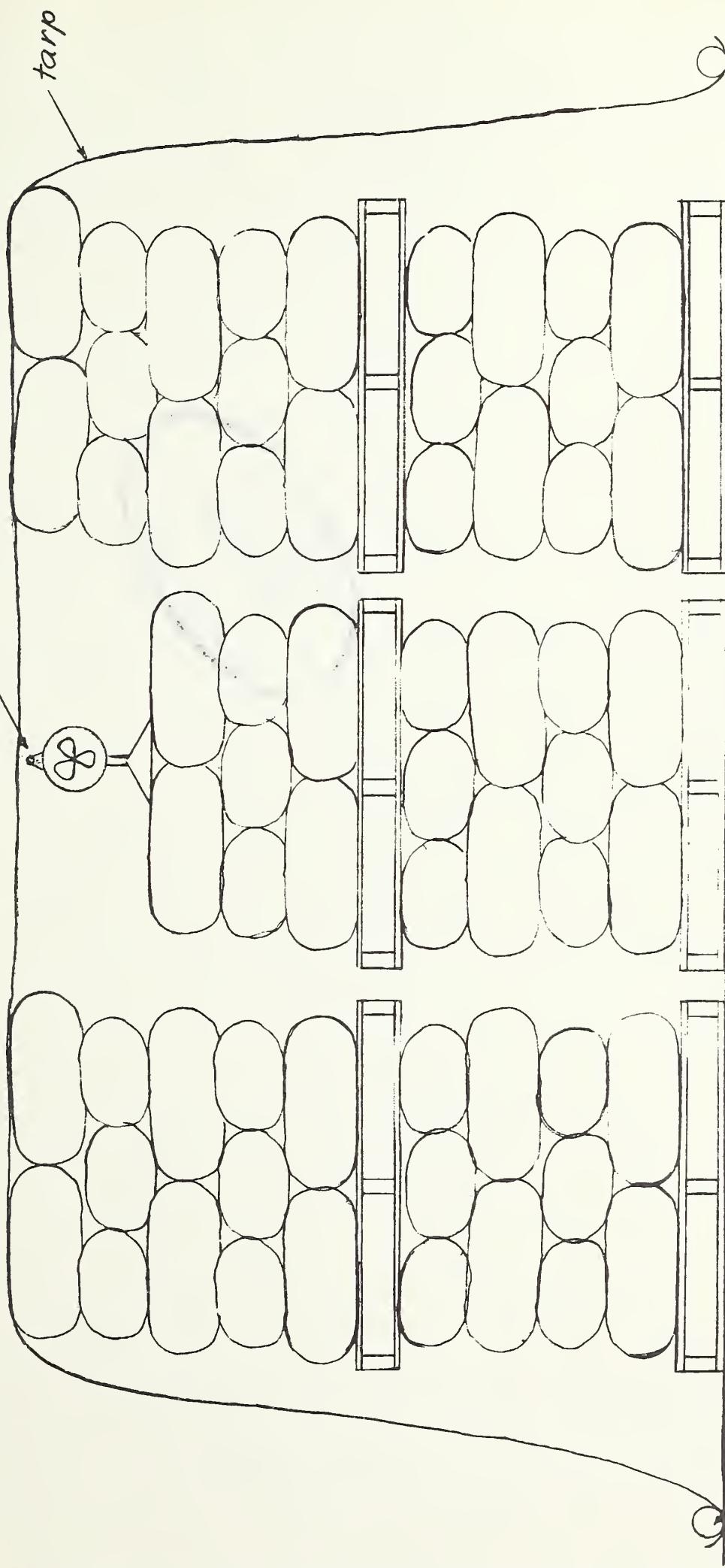
The dosage, exposure period, and methods of probing and sampling that apply to Category 1 apply to this treatment. The same precautions, sanitary measures, and spray applications shall also apply to properties treated in this Category. The treatment may be made applicable to all structures on the premises, or limited to only those in which infestations are known to exist, when, in the judgment of the inspector in charge, such a treatment may be reasonably expected to effect the eradication of the insect. It will be used in only those cases where conditions make the use of complete fumigation impractical. Properties treated in this manner shall be held under quarantine for one year after completing the treatment, and an inspection program as outlined in Category 2 shall be conducted on the properties.



pallet construction  
at least 1 pallet every  
10 ft of height of pile  
for circulation



tee jet nozzle 8003 to  
8006 or 9003 to 9006



sand snakes

seal can be obtained on smooth floor  
but better seal is obtained if loose sand  
is used as a base





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